

Facing this fact, it is not hard to see two converging lines along which the Service must proceed to establish itself in the confidence of the public. The one is to make better forecasts. The other is to make clear to the public just what the Service attempts to do and does do in the matter of making forecasts. If forecasts for definite areas and times could be reduced to mathematical exactness, the Bureau could proceed with its work without seeking to take the public into its confidence. But this period is not now and may never be reached; and the work along this line may be termed interior. The exterior work is along the other line, and the two must be pushed simultaneously till they meet at the surface.

Personal work in the form of popular lectures and courses in educational institutions will accomplish much in this direction. But greater, wider, quicker, and surer is the influence of the public press. This is the medium which offers freely to bring the Service daily into confidential relations with every fireside; and I speak advisedly and with deliberation when I say that the men in charge of stations should be held strictly accountable not only for the articles bearing upon meteorological conditions and occurrences appearing in the papers in their vicinity, but for those which should but do not appear. To plead or prove inefficiency in this particular is to fail to meet an imperative demand of the Service, and to demonstrate an unfitness for that particular field.

These may seem to you, my comrades, to be hard lines, but from your respectful and sympathetic attention I feel confirmed in the opinion that you have not sought or remained in this service either because it is easy or largely remunerative, but because of a love for the Service and a devotion to duty, brightened and strengthened by that bond of brotherhood everywhere manifested; a bond developed by years of association, and a devotion that gives the strongest assurance that the dignity of this Service will be maintained by meeting every requirement and discharging every duty.

#### RECENT PAPERS BEARING ON METEOROLOGY.

Mr. H. H. KIMBALL, Librarian and Climatologist.

The subjoined titles have been selected from the contents of the periodicals and serials recently received in the Library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau. Unsigned articles are indicated by a —.

*Knowledge.* London. New Series. Vol. 1.

— A scheme for the comparison of climates. P. 243.

*Scientific American Supplement.* New York. Vol. 58.

**Hopkins, N. Monroe.** The construction of an indicating or recording tin plate aneroid barometer. Pp. 24040-24042.

**Deslandres, H.** General organization of solar research. Continuous registering of the variable elements of the sun. P. 24070.

**Lendenfeld, R. von.** Climate and glaciers. Pp. 24070-24072.

— The mechanics of the atmosphere. Pp. 24072-24074.

*American Journal of Science.* New Haven. 4th Series. Vol. 18.

**Hutchins, C. C. and Pearson, J. C.** Air radiation. Pp. 277-286.

*Symons's Meteorological Magazine.* London. Vol. 39.

— Meteorology at the British Association. Pp. 141-142.

**Eliot, John.** Meteorology at the British Association. Address to the sub-section cosmical physics. [Climate of India. Pp. 142-147.]

**Shaw, W. N.; Dines, W. H.; Archibald, D.; Boys, C. V.; Buchan, A.; Glazebrook, R. T.; Mill, H. R.** Investigation of the upper atmosphere by means of kites in co-operation with a committee of the Royal Meteorological Society. Pp. 147-148.

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— The Dines recording barometer. Pp. 150-151.

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- Pringle, C. S.** Ball lightning. P. 153.  
**Russell, Spencer O.** Ball lightning. P. 153.  
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 — Relation of rainfall to run off. [Review of paper of George W. Rafter.] Pp. 299-300.  
 — Sun-spot periodicity and terrestrial phenomena. [Abstract of work of O'Reilly.] P. 512.  
**Poynting, J. H.** Radiation in the solar system. Pp. 512-515.  
**Lockyer, William J. S.** Astronomy and cosmical physics at the British Association. Pp. 536-538.  
*Scottish Geographical Magazine.* Edinburgh. Vol. 20.  
**Waite, Percival C.** The annual rise and fall of the Nile. Pp. 543-544.  
 — Scotia Bay meteorological and magnetical station. P. 552.  
*Bulletin of the American Geographical Society.* New York. Vol. 36.  
**Ward, R. DeC.** Sunshine and influenza. [Note.] P. 539.  
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**W[ard], R. DeC.** Transvaal meteorological service. [Note on article of R. T. A. Innes.] Pp. 543-544.  
 — The coldest region of the earth. [Note.] Pp. 546-547.  
**W[ard], R. DeC.** Antarctic meteorology. [Review of work R. C. Mossman.] P. 547.  
*American Inventor.* New York. Vol. 20.  
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*Geographical Journal.* London. Vol. 24.  
**Watson, E. R.** On the ionization of air in vessels immersed in deep water. Pp. 437-441.  
**MacLagan-Wedderburn, E.** Seiches observed in Loch Ness. Pp. 441-442.  
**H. A. J.** The annual rainfall of the British Isles. [Review of paper of H. R. Mill.] Pp. 466-468.  
*Electrical World and Engineer.* New York. Vol. 44.  
 — The magnetism of the earth. [Note on paper of L. A. Bauer.] P. 638.  
*Geographical Teacher.* London. Vol. 2.  
**Ward, R. DeC.** The climatology of the United States: an outline. Pp. 212-218.  
*Terrestrial Magnetism and Atmospheric Electricity.* Baltimore. Vol. 9.  
**Umow, N.** Die Construction des geometrischen Bildes des gauss'schen Potentials, als Methode zur Erforschung der Gesetze des Erdmagnetismus. Pp. 105-112.  
**Bauer, L. A.** The physical decomposition of the earth's permanent magnetic field. No. IV. Pp. 113-133.  
**Bemmelen, W. van.** Magnetic survey of the Dutch East Indies. Pp. 135-136.  
**Moidrey, J. de.** Note sur l'amplitude de l'oscillation diurne de la déclinaison magnétique et son inégalité annuelle. Pp. 137-139.  
*Cold Storage and Ice Trade Journal.* New York. Vol. 28.  
**Wegemann, Karl.** The use of hygrometrical instruments. Pp. 30-33.  
*Transactions of the Connecticut Academy of Arts and Sciences.* New Haven. Vol. 11.  
**Verrill, Addison, E.** The Bermuda Islands, their scenery, climate, productions, physiography, natural history, and geology; with sketches of their early history and the changes due to man. Pp. 17-956.  
*Science Abstracts.* London. Vol. 7.  
**B[urbury], S. H.** Principles of aërodynamics and their application to some special problems. [Abstract of article of M. Smoluchowski-Smolani.] Pp. 639-640.  
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**B[orns], H.** General circulation of the atmosphere in middle and higher latitudes. [Abstract of article of W. N. Shaw.] P. 641.  
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*Comptes Rendus de l'Académie des Sciences. Paris. Tome 139.*

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Pigeon, Léon. Sur un effet de vide produit par une trombe. Pp. 535-538.

*La Géographie. Paris. Vol. 9.*

Angot, A. Les observations météorologiques de la Mission saharienne Foureau-Lamy. Pp. 1-4.

Deniker, J. Voyage de M. Tsybikov à Lhassa et au Tibet. [Observations at Lhassa.] P. 25.

Laloy, L. Climat et flore du bassin méditerranéen. [Review of work of A. Philippson.] Pp. 31-35.

*Bulletin de la Société Belge d'Astronomie. Bruxelles. 9me année.*

— Le variomètre. Pp. LIII-LIV.

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*Ciel et Terre. Bruxelles. 25me année.*

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— Courants aériens verticaux en temps d'orage. [Extract from article of Santos-Dumont.] Pp. 374-375.

*Das Wetter. Berlin. 21 Jahrgang.*

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Gockel, Albert. Radioaktive Emanationen in der Atmosphäre. Pp. 591-594.

*Annalen der Physik. Leipzig. Vierte Folge. Band 15.*

Bestelmeyer, A. and Valentiner, S. Ueber die Dichte des Stickstoffs und deren Abhängigkeit vom Druck bei der Temperatur der flüssigen Luft. Pp. 61-73.

Valentiner, Siegfried. Ueber die Abhängigkeit des Verhältnisses  $c_p/c_v$  der spezifischen Wärmen des Stickstoffs vom Druck bei der Temperatur der flüssigen Luft. Pp. 74-106.

*Physikalische Zeitschrift. Leipzig. 5 Jahrgang.*

Rebenstorff, H. Ein einfacher Apparat zur Untersuchung der Nebelbildung und über Anordnung der Nebelkerne bei der elektrischen Spitzenentladung. Pp. 571-574.

Gaea. Leipzig. 40 Jahrgang.

— Versuche und Beobachtungen über Regentropfen. Pp. 650-656.

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— Die Ursache des Donners. P. 690.

— Internationale wissenschaftliche Luftfahrten. Pp. 690-691.

*Geographische Zeitschrift. Leipzig. 10 Jahrgang.*

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*Wiener Luftschiff-Zeitung. Wien. 3 Jahrgang.*

— Internationale Kommission für wissenschaftliche Luftschiffahrt. Pp. 218-219.

*Annalen der Hydrographie und Maritimen Meteorologie. Berlin. 32 Jahrgang.*

Heyne, —. Die Witterung zu Tsingtau im März, April und Mai 1904, nebst einer Zusammenstellung für den Frühling 1904. (Bericht der Kaiserlichen Meteorologisch-astronomischen Station in Tsingtau.) Pp. 465-469.

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Herrmann, E. Haben zeitliche erdmagnetische Störungen Bedeutung für die Navigation? [Review of article of August Krogh.] Pp. 486-487.

*Boletim da Sociedade de Geografia de Lisboa. Lisboa. 22 Série. 1904.*

Berthoud, Paul. Météorologie de Lourenco Marques. Pp. 255-257.

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*Himmel und Erde. Berlin. 16 Jahrgang.*

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— Verband tusschen de weersgesteldheid aan den Oost-en den Weststrand van der Atlantischen Oceaan. Pp. 76-77.

*Monthly Consular Report. Washington. August, 1904.*

Mason, Frank H. Serious drought in Germany. Pp. 58-59.

### VORTEX RINGS AS REVOLVING SOLIDS.

By Dr. F. J. B. CORDEIRO, Surgeon U. S. Navy. Dated San Francisco, U. S. S. *Solace*, March 21, 1904.

It appears that my use of the smoke rings<sup>1</sup> as an illustration of the fact that a gas moving in a certain manner may become, for dynamical purposes, a solid was not satisfactory to the Editor. Permit me, therefore, to give another illustration, nay, a proof, that we may regard the cyclone as a revolving solid.

Suppose we coil a tube into a spiral, so as to imitate to any degree of approximation the flow of the currents of air in the cyclone, and suppose that, by means of flexible tubes, we permit a stream of water to enter at one end and leave at the other end of the spiral. If the water passes through with great velocity, and we turn the revolving mass in the direction of the arrow [i. e., so as to change the plane of the spiral], a gyroscopic force will be set up, normal to the plane of turning. Such an experiment can easily be carried out at any time. Now let us, instead of water, substitute a stream of air; the same gyroscopic forces will be set up, only proportionately less, as the mass of the air is less than that of the water. Now the rigid spiral tube and the flexible tubes have no part in the gyroscopic action, but are used only to cause the air to assume the motion it does in the cyclone. In a cyclone the centripetal forces take the place of the artificial constraints we have used in our experiments. Consequently, air currents rotating in such a manner must give rise to gyroscopic forces. Now a cyclone, though moving, preserves its shape and that of its air currents, although, as in our experiment, new air is being constantly taken in and thrown out. The amount of gyroscopic action will depend upon the mass of air in rotation and its velocity. Only the motion at right angles to the axis will be effective in this connection. The motion toward the axis will produce no gyroscopic effect. Now, for the purposes of our problem, we can substitute a solid gyroscope, producing an equivalent gyroscopic effect. This seems to me to be a rigid demonstration that the poleward acceleration of a cyclone is due simply to the gyroscopic forces generated, and I believe I am the first to have explained this phenomenon.

Now, as to Ferrel's work. This author certainly had an inkling that there were certain forces called into play setting cyclones poleward, but his demonstration mathematically of such forces was far from correct. His formula (52, quoted in the MONTHLY WEATHER REVIEW, 1903, p. 517), which gives for the accelerating force in the direction of the meridian

$$\frac{V}{M} = - \frac{g u \sin \phi}{578 n} \left( \frac{s'}{R} \right)^2,$$

is not correct. This does not express the acceleration northward (or southward).

I think there can be no doubt that Ferrel was not familiar with the analysis of motion of the gyroscope; and for that matter, few if any persons at that time (1857 and before) understood its motion. Professor Olmstead, late professor of natural philosophy and astronomy in Yale College, published a Natural Philosophy, I think as late as 1850, in which he refers to the gyroscope as the "mechanical paradox," and states that its motion is not understood. It was Major Barnard who gave the first clear exposition of its motion in this country. I believe, if my memory serves me right, that his book, Analysis of Rotary Motion as Applied to the Gyroscope, was written in 1859.

<sup>1</sup>See "The problem of the cyclone." Monthly Weather Review, August, 1903, p. 516.